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Indian Standard

SPECIFICATION FOR BINARY DIRECT VOLTAGE SIGNALS FOR PROCESS MEASUREMENT AND CONTROL SYSTEMS

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard

SPECIFICATION FOR BINARY DIRECT VOLTAGE SIGNALS FOR PROCESS MEASUREMENT AND CONTROL SYSTEMS

0. FOREWORD

0.1 This Indian Standard was adopted by the Bureau of Indian Standards on 27 October 1988, after the draft finalized by the Industrial Process Measurement and Control Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Binary direct voltage signal varies in a discrete manner corresponding to two states, used in industrial-process measurement and control systems to transmit information corresponding to two logical states. The binary direct voltage signal which appears at the input/output terminals of an element has two logical states which are represented by the signal voltages U_H for the high level and U_L for the low level. Each of these signal voltages has a range defined by an upper and a lower limit.

0.3 While preparing the standard, assistance was derived from IEC, draft publication 65A (Central Office) 16 'Binary direct voltage signals for process measurement and control systems', issued by the International Electrotechnical Commission (IEC) in July 1985.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

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1. SCOPE

1.1 This standard is applicable to non-multiplexed two wire binary direct voltage signals of nominal 24 volt level that are used to transmit information between elements in industrial process measurement and control systems.

1.2 This standard does not apply to signals that are entirely within such elements.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Binary Direct Voltage Signal — A dc voltage quantized signal with two values, used to transmit information as stated in **1.1**.

2.2 Current Sourcing Circuit — Within the range of U_H, the output of an element supplies current to the inputs or other loads driven by it.

2.3 Elements of Industrial Process Measurement and Control Systems — Functional units or integrated combinations thereof which transduce, process or transmit measured values, controlling, controlled and reference variables.

2.4 Leakage Current — In case of a current sourcing circuit, leakage current is defined as the value of current flowing from an output, within the range of U_L.

2.5 Minimum Signal Duration — The shortest time of a binary input signal, which in any case, is sufficient to initiate transition from one voltage range to the other.

2.6 Nominal Load Factor — The nominal load factor indicates the load capacity of an output or the load imposed by the respective input.

It is used for engineering purposes and is expressed as a multiple of the nominal load unit. The abbreviation for input is F_i and that for the output is F_o.

2.7 Power Supply — The supply that provides the necessary dc power to enable a system element to generate the binary direct voltage signal.

2.8 Signal Common — A number of signal circuits may have a common direct electrical connection. This is the signal common which may or may not be connected to earth.

2.9 State Transition Time — The time required for transition from one voltage range to other in case of a change between logic states.

3. REQUIREMENTS

3.1 Type of Circuits — System elements shall have current sourcing circuits.

3.2 Range of Binary Direct Voltage Signals of Nominals 24 Volts Level — The ranges of binary direct voltage signals shall be as given in Table 1.

TABLE 1 RANGES OF BINARY DIRECT VOLTAGE SIGNALS

(*Clause* 3.2)

	Low Level U_L (V)		High Level U_H (V)	
	Lower Limit	Upper Limit	Lower Limit	Upper Limit
Output	0	2	16	30
Input	−3	5	13	33

The limits include all ac voltage components and are valid for a load resistance of 20 kΩ.

3.3 Nominal Load Factors

3.3.1 For the calculation of nominal load factor of input F_i, the current voltage characteristic of the input will be replaced by a linear characteristic in such a way that the actual input current, even under worst operation conditions, within the entire range of U_H will be lower than the current required according to the substitute linear characteristic (*see* Fig. 1).

3.3.2 The nominal load factor of an input F_i will then equal the quotient of current, resulting at 24 volts from the substitute linear characteristic, to the nominal load unit represented by a current of 2 mA.

The nominal load factor of an output F_o indicates how many inputs with a nominal load factor F_i = 1 may be connected to this output.

3.4 Leakage Current — The leakage current shall not exceed 0·1 mA under worst case operating conditions.

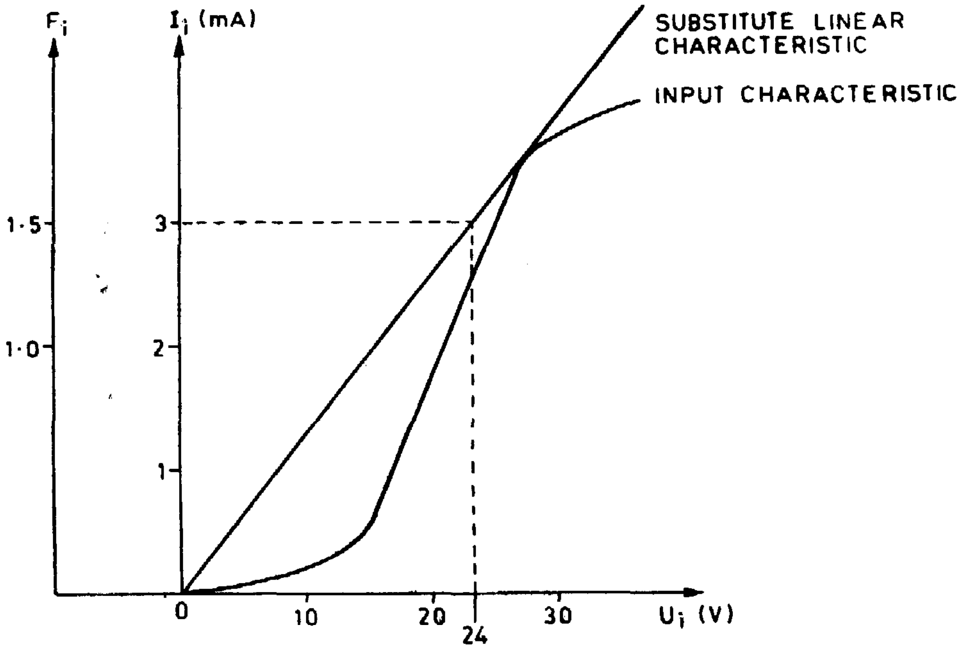
3.5 State Transition Time — The state transition times for output signal changes in both directions shall be specified for worst case conditions.

For inputs, the maximum permitted state transition time for signal changes in both directions shall be specified for worst case conditions.

3.6 Minimum Signal Duration — The minimum duration of an input signal needed to initiate a reaction of an element in both directions shall be specified for worst case conditions.

3.7 Signal Common — The signal negative shall be the signal common. If the signal common is connected to dc power supply, it shall be connected to the negative terminal or zero volt terminal in case of a bipolar power supply.

3.8 Earthing — If a signal circuit is to be earthed, the signal negative or the power supply negative shall be earthed (or the zero volt terminal in case of a bipolar power supply).



NOTE — I_i at U_i — 24 Volts equals 3 MA; this divided by the nominal load unit of 2 mA results in a nominal load factor of F_i=1·5.

FIG. 1 CALCULATION OF THE NOMINAL LOAD FACTOR F_i FOR ELEMENTS WITH NON LINEAR INPUT CHARACTERISTIC

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